

## **KNOWLEDGE EXPECTATIONS FOR PEST CONTROL ADVISERS PLANT GROWTH REGULATORS**

Be familiar with the general uses and classification of the following plant growth regulators:

### Auxins:

- 1-naphthalenacetic acid (NAA)
- 2,4-D
- 3-indoleacetaldehyde acid (IAld)
- 3-indoleacetic acid (IAA)
- 3-indolepyruvic acid (IPA)
- indolebutanoic acid (IBA)

### Gibberellins (GA):

- GA<sub>4</sub>GA<sub>7</sub>
- GA<sub>3</sub>

### Cytokinins:

- CPPU
- kinetin

### Ethylene/Ethylene releasers

- ethephon
- ethylene

### Inhibitors/Retardants:

- abscisic acid (ABA)
- ancymidol
- carbaryl
- chlormequat
- chloro IPC
- daminozide
- flurprimidol
- hydrogen cyanamide
- maleic hydrazide (MH)
- mefluidide
- mepiquat chloride
- paclobutrazol
- prohexadione calcium
- succinic acid (SADH)
- uniconazole

## **I. PLANT GROWTH REGULATORS**

Define plant growth regulator.

List the common classes of plant growth regulators. (auxins, gibberellins, cytokinins, growth retardants/inhibitors, ethylene, others)

List the plant growth regulators that play a major role in:

- dormancy;
- seed germination;
- fruit set;
- fruit ripening;
- abscission;
- fruit abscission;
- root initiation;
- stem elongation;
- plant senescence.

Recognize that plant growth regulators can act at low concentrations.

Recognize that plant growth regulators can have undesirable effects when applied at improper rates or times.

Describe how environmental conditions and the plant developmental stage can affect the activity of plant growth regulators.

Compare/contrast the ability of a plant growth regulator or plant hormone to stimulate growth and retard growth in different situations.

Differentiate between a plant growth regulator and a plant hormone (plant growth substance).

Define:

- plant hormone;
- abscisic acid (ABA).

List the “classical” five naturally occurring plant hormone groups. (auxins, cytokinins, ethylene, the gibberellins, abscisic acid)

Describe how each type of plant growth regulator affects:

- seed dormancy;
- seed growth;
- vegetative growth;
- flower and fruit growth.

Describe the specific physiological processes in plants that are regulated by the following class of plant growth regulators:

- auxins;
- gibberellins;
- cytokinins;
- growth retardants/inhibitors;
- ethylene.

Recognize that plant growth regulators interact with other organic compounds (hormones and other growth regulating substances) in plants.

### **Auxins**

Define:

- auxin;
- 3-indoleacetic acid (IAA).

Describe the effect of auxins on plant growth.

List the primary uses of auxins as plant growth regulators and identify the crops on which they are used.

- (reduces fruit drop, increases fruit drop, delays maturation, blossom thinning agent, sets fruit, enhances adventitious root formation, delays color development).

List the auxins contained in plant tissues.

- (3-indoleacetic acid (IAA), 3-indoleacetaldehyde (IAld), 3-indolepyruvic acid (IPA), 3-indoleacetonitrile (IAN), ethyl ester of indoleacetic acid (IAE)).

Describe the effect of auxin on ethylene.

Recognize that auxins are also used as herbicides and give an example.

### **Gibberellins**

Define gibberellins (GA).

Describe the effect of gibberellin on plant growth.

List the primary uses of gibberellins as plant growth regulators and identify the crops on which they are used.

- (cell elongation, cell division, overcoming dormancy, overcoming or breaking bud dormancy, increases fruit set, affects fruit shape, fruit maturation, delay of flowering in fruit trees, stimulates flowering and bolting in biennials).

Describe how gibberellins stimulate plants to overcome dormancy.

Recognize that there are over 100 different chemical structures of gibberellins but only a few are used commercially.

Compare/contrast GA<sub>3</sub> and GA<sub>4</sub>GA<sub>7</sub>.

Identify the primary gibberellins used.

Identify the primary crop and use of GA<sub>4</sub>GA<sub>7</sub>.

Identify the primary use of GA<sub>3</sub> in citrus.

### **Cytokinins**

Define cytokinins.

Describe the effects of cytokinins on plant growth.

### **Ethylene**

Define ethylene.

Recognize that ethylene is a gas.

Describe the effect of ethylene on plant growth.

List the primary uses of ethylene and identify the crops on which it is used.

(induces fruit ripening, induces flowering, accelerates fruit and leaf abscission, promotes lateral branching, promotes shortened stems on grain crops, increases straw strength, hybrid seed production, boll opening in cotton, fruit elimination, thinning agent, postharvest degreening of fruit in citrus).

Understand the relationship of ethephon to ethylene.

### **Growth retardants and inhibitors**

Define plant growth inhibitor (retardant).

List the materials that are primarily used as growth retardants and inhibitors and identify the crops on which they are used.

(paclobutrazol, uniconazole, fluprimsidol, prohexadione calcium, ancymidol, chlormequat, mepiquat chloride, mefluidide).

Describe how paclobutrazol, uniconazole, fluprimsidol, prohexadione calcium, and mepiquat chloride inhibit plant growth.

Describe the primary uses of maleic hydrazide (MH).

Describe the use of carbaryl as a plant growth regulator.

## **II. PLANT GROWTH CONCEPTS**

Define:

- xylem;
- phloem;
- meristem;
- apical meristem;
- cambium;
- abscission;
- apical dominance;
- bioassay;
- cultivars;
- dormancy;
- endogenous;
- locules;
- parthenocarpy;
- phenotypic;
- rachis;
- rest period;
- senescence.

## **III. APPLICATION TECHNOLOGY**

Define the following terms and describe their importance when using plant growth regulators:

- calibration;
- parts per million.

Describe the relationship between dosage, volume and efficacy when applying plant growth regulators.

Describe the importance of pH when using plant growth regulators.

Describe how to determine the need for a surfactant when using plant growth regulators.

Describe how to avoid drift in the application of plant growth regulators.

Recognize that plant growth regulators can be incompatible with other chemicals when combined in a tank mix.

Describe how the following factors affect the appropriate dosage when using plant growth regulators:

- rainfall;
- pH;
- temperature;
- humidity;

sunlight;  
plant growth stage  
other environmental factors.

Recognize the importance of reading and understanding the language on the label of a plant growth regulator.

Interpret all terms and concepts on a plant growth regulator label.

Recognize that specific hazards are associated with the following plant growth regulators:

corrosive – ethephon;  
flammable – ethephon, gibberellin;  
eye injury – ethephon, gibberellin;  
hazard to bees – carbaryl;  
potential to injure target and nontarget plants – all.